CLAIMS

We claim:

1. An array of a plurality of carbon nanotubes, each of said carbon nanotubes having a first end attached to a substrate, and a second end extending from said substrate, each of said carbon nanotubes having a closed outer wall defining a core that is hollow, wherein said core is filled more than 10% with a conductive filler.

2. The array as recited in claim 1, wherein each of said carbon nanotubes is in physical contact with at least one nearest-neighbor carbon nanotube.

3. The array as recited in claim 1, wherein said substrate is a conductive substrate.

4. The array as recited in claim 3, wherein said conductive substrate is selected from the group consisting of titanium, titanium carbide, vanadium, tantalum, and combinations thereof.

5. The array as recited in claim 1, wherein said conductive filler comprises carbon and an element from the group of elements consisting of titanium, vanadium, tantalum, and combinations thereof.

6. The array as recited in claim 3, wherein said conductive substrate is a prepared substrate having a catalyst coating.

7. The array as recited in claim 6, wherein said catalyst coating is a growth catalyst.

8. The array as recited in claim 7, wherein said growth catalyst is selected from the group consisting of iron, iron oxide and combinations thereof.

9. The array as recited in claim 1, wherein said carbon nanotubes are of uniform length such that the length of each of said carbon nanotubes varies no more than 5%.

10. The array as recited in claim 9, wherein said length ranges from 1 to 2 μm.

11. The array as recited in claim 1, wherein said carbon nanotubes are of uniform diameter such that the diameter of each of said carbon nanotubes varies no more than 5%.

12. The array as recited in claim 1, wherein said diameter is an outside nanotube diameter ranging from 50 to 400 nm and an inside nanotube diameter ranging from 10 to 100 nm.

13. A method for synthesizing an array of a plurality of carbon nanotubes, each of said carbon nanotubes having a first end attached to a substrate, and a second end extending from said substrate, each of said carbon nanotubes having a closed outer wall defining a core that is hollow, wherein said core is filled more than 10% with a conductive filler, comprising the steps of:

(a) depositing a growth catalyst onto said substrate forming a prepared substrate;

(b) creating a vacuum within a vessel containing said prepared substrate;

(c) flowing H2/Ar gas within said vessel and increasing the pressure within said vessel;

(d) increasing the temperature of said prepared substrate; and

(e) changing said H2/Ar gas to ethylene gas such that said ethylene gas flows within said vessel.

14. The method as recited in claim 13, wherein said depositing comprises depositing a layer of said growth catalyst by electron beam evaporation.

15. The method as recited in claim 14, wherein said layer is a thin layer between about 1 to 30 nanometers in thickness.

16. The method as recited in claim 13, wherein said growth catalyst is selected from the group consisting of iron, iron oxide and combinations thereof.

17. The method as recited in claim 13, wherein said vacuum is a pressure at or below 1 torr.

18. The method as recited in claim 13, wherein said vessel is a quartz reactor.

19. The method as recited in claim 13, wherein said pressure is a pressure within the range of pressures between 200 torr and 400 torr.

20. The method as recited in claim 13, wherein said vessel is within a tube furnace for said heating.

21. The method as recited in claim 13, wherein said temperature is a temperature within the range of temperatures between 650°C and 800°C.

22. The method as recited in claim 13, wherein said substrate is a conductive substrate.

23. The method as recited in claim 22, wherein said conductive substrate is selected from the group consisting of titanium, titanium carbide, vanadium, tantalum, and combinations thereof.

24. The method as recited in claim 13, wherein said conductive filler comprises carbon and an element from the group of elements consisting of titanium, vanadium, tantalum, and combinations thereof.

25. The method as recited in claim 13, wherein said growth catalyst is selected from the group consisting of iron, iron oxide and combinations thereof.

26. The method as recited in claim 13, wherein said carbon nanotubes are of uniform length such that the length of each of said carbon nanotubes varies no more than 5%.

27. The method as recited in claim 26, wherein said length ranges from 1 to 2 μm.

28. The method as recited in claim 13, wherein said carbon nanotubes are of uniform diameter such that the diameter of each of said carbon nanotubes varies no more than 5%.

29. The method as recited in claim 28, wherein said diameter is an outside nanotube diameter ranging from 50 to 400 nm and an inside nanotube diameter ranging from 10 to 100 nm.